

Semi-Annual Progress Report No. 3

"Rocket Studies of the Lower Ionosphere During the IQSY"

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## I. Introduction

This grant is for study and experiment pertaining to the D- and E-regions of the ionosphere, as part of the United States program for the International Years of the Quiet Sun.

## II. Work Accomplished to Date

Preparations for participation in the NASA mobile launch program have continued. A vertical incidence sounder was designed, constructed and installed in an equipment van and loaded aboard the USNS Croatan. Antennas were erected prior to the October, 1964 "shakedown" cruise. During this preliminary cruise the sounder, antennas and all associated equipment were tested and operated. During the cruise two sounding rockets were fired from aboard ship (Nike-Apache 14.148 and 14.149) and one from Wallops Island (Nike-Apache 14.147). All three rockets were successful.

After completion of this cruise, the sounder and van were returned to the University of Illinois for final modification in preparation for the extended cruise. The van was then shipped back and reloaded aboard the carrier for the cruise which took place in March and April, 1964. The antenna system aboard the ship was also redesigned prior to the March sailing. NASA Nike-Apache rockets 14.228 and 14.229 were fired from the aircraft carrier on March 20, 1965, and March 23, 1965, respectively. The latter shot was unsuccessful because of a telemetry failure. It is the only unsuccessful rocket of the ten fired in our IQSY program to date. A third rocket was launched on Monday, April 5, 1965 from aboard the ship and was successful. The mobile launch program will continue through April, 1965.

A new receiving antenna array was constructed at the Wallops Island field station and tested during October, 1964. The Wallops Island sounder

was operated during the firing of Nike-Apache rocket 14.147 on November 10, 1964. Data obtained during this period is currently being analyzed. Partial reflection and absorption data were also taken in February, 1965 at Wallops Island, at which time the sounder equipment was repaired and modified to incorporate latest designs.

A system to automatically record and analyze sounder data is presently being designed. The data is to be recorded on punched tape which may then be fed into a computer to make direct computations of electron density profiles.

Theoretical and experimental investigation of rocket-borne probes for direct measurement of electron densities in the ionosphere has continued. A computer program has been written to aid in theoretical investigation of probe characteristics. Data obtained from the July 15, 1964 rocket firings at Wallops Island, Virginia, have been compared to theoretically-predicted values of probe current. Experimental equipment has been improved so that pressure and electron density conditions in the ionosphere may be duplicated in the laboratory. A data recording system has been constructed for plotting DC probe characteristic curves, and instrumentation for dynamic measurement of resonance probe characteristics is also now complete. Measurements are presently being made using various probe configurations.